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# Homophily and peer influence in early-stage new venture informal investment

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**Abstract** Conceptualising early-stage new venture informal investors as co-entrepreneurs whose actions are socially embedded, we examine the role of social influence and how it interplays with entrepreneurial experience at the individual level leading to informal investment. We extend theories of social homophily and social influence to argue that informal investment decisions are influenced by shared experience and entrepreneurism in peer groups. We test our hypotheses with a multi-level model using first a large cross-country dataset and next in depth within a country. Our analysis reveals that both individual entrepreneurship experience and peer group-embedded experience significantly influence the likelihood that an individual becomes an early-stage investor. Furthermore, these social effects substitute for the lack of individual entrepreneurial experience.

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**Plain English Summary** The key role of peer groups in informal investment. In this paper, we use a large multi-country database (Global Entrepreneurship Monitor) to explore what leads people to become an informal investor in new ventures. Informal investors, sometimes referred to in developed economies as business angels but also a widespread phenomenon in developing countries, play a key role in the formation and establishment of new ventures in the early stages, second only to the entrepreneurs themselves. We identify two crucial factors determining the decision to become an informal investor, namely, prior experience as an entrepreneur and membership of a peer group with high entrepreneurial experience (social homophily). Thus, individuals are more likely to become informal investors when their peers, in groups defined by age, gender, education, income and neighbourhood, have higher levels of entrepreneurial business experience. Moreover, membership of an experienced peer group can to some extent substitute for deficiencies in one's own entrepreneurial experience. Our work highlights the importance of social networks, role models and peer group–based entrepreneurial ecosystems in fostering entrepreneurship in developing as well as developed economies.

**Keywords** Informal investors · Entrepreneurial experience · Social homophily · Peer influence · Entrepreneurship capital · Global Entrepreneurship Monitor (GEM) · Angel investors

**JEL classifications** L26 · M13 · G32

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## 1 Introduction

Early-stage informal investment spans across developed and emerging countries, with investors representing an important group of players in new venture creation, often the most important ones other than the founder themselves (Wetzel, 1983, 1987). This is because the former are providers of critical early finance to entrepreneurs at the start of new venture development (Burke et al., 2014; Korosteleva & Mickiewicz, 2011; Wetzel, 1983). Moreover, they are intrinsically motivated and often personally engaged in the creation of the new firm. In this paper, we conceptualise them as entrepreneurial co-decision-makers who are embedded in their own social environment. This leads us to investigate, first theoretically and then empirically, the role of social influence and how it interplays with entrepreneurial experience at the individual level, leading to informal investment in the early stage of the new venture.

The literature on informal investment has largely focused on the role of angel investors (Drover et al., 2017; Levratto et al., 2018; Tenca et al., 2018; Wetzel, 1987), but angels are primarily a developed economy phenomenon (Riding, 2008; Sohl, 2003; Stedler & Peters, 2003). It is the more general construct of informal investor that is much more widespread globally: as Edelman et al. (2017) argue, there is no 'robust angel investment community internationally' (Ibid, p. 266). Because we focus on early-stage new venture funding in both developed and emerging economies, we emphasise the more general concept of early-stage informal investment rather than the more geographically restricted idea of angel investment.

Early-stage informal investors are typically closely linked to the entrepreneur, as friends, associates or close or extended family members (Aram, 1989; Korosteleva & Mickiewicz, 2011; Landström, 1998; Mason, 2008; Maxwell, 2011; Sullivan & Miller, 1996). Hence, their motivation as investors is often very different from that of more conventional providers of finance. In addition to financial return, their objectives may include intrinsic benefits arising from the creation of a new venture by somebody that they know personally. This is consistent with their willingness to invest in entrepreneurial ventures at a very early stage — often without a tested product or a proven business model — when there is little basis to assess risks; unsurprisingly, trust plays a key role in informal investment (Harrison et al., 1997).

Moreover, informal investors have 'skin in the game' (Taleb, 2018); they invest their own money, not on behalf of others. Because of this individual agency, we posit that informal investors' actions will be influenced by both their own entrepreneurial experiences and also by the social structures around them, in particular, by the experience of their peer groups. Drawing upon Audretsch and Keilbach (2004, 2007), we denote the entrepreneurialism of one's peer group as (network) *entrepreneurship capital* and identify two types of social homophily effects: (1) between informal investors and their investment recipients resulting from shared experience and (2) pertaining to network entrepreneurship capital in peer groups. Thus, we argue that the choice to engage as an informal investor is affected by the individual's entrepreneurial experience, their corresponding social experience of peer groups (entrepreneurship capital) and the individual–peer interplay of the two. Furthermore, we expect that entrepreneurship capital will compensate for the lack of individual experience of early stage informal investors as a consequence of learning and knowledge spillover effects within peer groups.

To test our hypotheses, we use a large dataset (the Global Entrepreneurship Monitor (GEM) survey) containing information of 1,287,997 individuals across 92 countries and 14 years; as well as a large country-specific sub-sample to explore peer effects in more depth. The structure of the data leads us to utilise multi-level econometric techniques. We find that individuals with greater entrepreneurial capital are more inclined to invest in other entrepreneurs' ventures than those without such personal experiences. However, social effects are also important, both in their own right and as a substitute for entrepreneurial capital: the positive effect of social entrepreneurship capital is more important for informal investors with less of their own entrepreneurial experience.

Besides testing social influence in the multi-country dataset, we also performed further analysis to verify if and how the homophily effects we postulated might change when we focus on within-country regional variation instead. For this purpose, we utilise GEM data with location identifiers

for 2002–2019[1] in the UK — one of the very few countries with large enough annual samples to allow meaningful regional comparisons (Hart et al., 2020). We discuss these findings in comparison with the cross-country analysis to flesh out the nuances of the role of social context.

Our study contributes to the entrepreneurship literature in several ways. First, we develop a model in which informal investment decisions are influenced by social homophily effects in peer groups. We thereby extend the informal investment literature from a focus on the narrower concept of business angels — who usually operate on a formal or contractual basis and primarily in developed countries — to the broader concept of informal investors. We draw on the key role of peer groups in the relationship between informal investors and entrepreneurs to develop and test theoretical arguments about entrepreneurship capital and social homophily effects. In so doing, we advance the literature on informal investors' behaviour (Burke et al., 2014; Korosteleva & Mickiewicz, 2011).

Secondly, our study provides an analysis of how social influence shapes informal investors' decisions both directly and by moderating individual-level factors. We test these effects in multi-level models. Methodologically, it is usually difficult to test cross-level effects (e.g. individual meso) in a single study due to data constraints (Klein & Kozlowski, 2000), because datasets with meso-level information are usually only available for samples within a single country, rarely with the coverage of multiple countries. Adopting the concept of peer groups allows us to construct meso-level peer influence variables and to test them in conjunction with individual-level effects in one of the largest entrepreneurship datasets. This novel approach opens a new avenue for cross-level analysis for future studies (Kim et al., 2016).

Finally, we contribute to the literature on entrepreneurship by applying the theory lenses of social homophily and social influence in the novel setting of early-stage new venture informal investment. Although social homophily and social influence effects have been studied in a variety of settings related to entrepreneurship (e.g. Greenberg & Mollick, 2015, 2017; Kacperczyk, 2013; Nanda & Sørensen, 2010; Qin, 2011; Qin & Estrin, 2015; Stuart & Ding, 2006; Tartari et al., 2014; Thornton, 1999), they have rarely been examined in the context of the meso-societal level. By taking into account meso-societal-level social influence, we capture an understudied but important type of social influence — that from one's broader peer groups beyond the individual's immediate networks. Our results therefore provide further validation of the related theory in an important new setting.

In the next section, we present our theory and motivate our hypotheses. The subsequent section is on data and methods. Further down, we present results and robustness checks. In the final part of the paper, we offer discussion and conclusions.

## 2 Theoretical background and hypotheses

### 2.1 Informal investor: beyond financial provision

Informal investors are motivated by social ties as well as financial returns and may therefore have long time horizons[2] (Aram, 1989). Indeed, the stewardship view (Davis et al., 1997) suggests that informal investors' motives are closer to those of founders than of financiers, in that they are often intrinsically rather than extrinsically motivated and their focus is more on involvement than control ( Edelman et al., 2017; Politis & Landström, 2002). Moreover, in contrast to formal investors such as venture capitalists, who invest on behalf of their providers of finance and expect to exit within a limited time period (linked to the horizon of those investors), informal investors invest their own money and are less constrained with respect to time of exit (Harrison & Mason, 2002). Thus, informal investors are typically involved from the initial stage of new business formation, unlike venture capitalists who come at a later stage of venture development (Gompers & Lerner, 2004).

Thus, the role of informal investors also goes well beyond simply supplying funding: instead,

[1] We are grateful to Mark Hart and Neha Prashar for sharing the harmonised UK GEM data for the purpose of this exercise.

[2] Thus, the phenomenon we analyse shares some features with family firm engagement (Barros et al., 2017) in that the socio-economic wealth created within families or between friends can be appropriated for the sake of business venturing. However, the major difference is that informal investors are not the owner-managers of the new venture.

they tend to behave in a manner closer to partners of the founders, that is to say, as co-entrepreneurs (Politis & Landström, 2002; Politis, 2008). Informal investors are exposed to the same and, considerable, downside risks from the new venture ideas as venture capitalists (and entrepreneurs), but they mitigate these risks by active involvement in the operations of the business (Kerr et al., 2014).

At this point, we need to introduce a brief digression on terminology. It is widely agreed that informal investors fill an important equity gap between self-funding and later-stage equity investment (Gompers & Lerner, 2004; Harrison & Mason, 1992; Hellmann et al., 2017; Manigart & Wright, 2013; Sullivan & Miller, 1996). Earlier discussions of informal investors describe a class of financiers implicitly based in developed economies, who provide seed capital to new ventures (Wetzel, 1983). Later on, the Global Entrepreneurship Monitor project (Reynolds et al., 2005) adopted the term 'business angels' to describe all early-stage informal investors, and this was also introduced in the GEM-based empirical literature (Wong et al., 2004). However, this usage differs from the way that 'business angels' are defined in the finance literature (Edelman et al., 2017), much of which focuses on developed countries. The wide presence of informal capital is one of the unique aspects of entrepreneurial financing in emerging economies where the access to formal sources of capital is more constrained (Wu et al., 2016). Thus, informal investment is a far more widespread phenomenon than just business angel finance, and it can be found in both developed and developing economy settings (Burke et al., 2014; Korosteleva & Mickiewicz, 2011).

In sum, informal investors are a distinct group of actors in new venture creation, often working closely with entrepreneurs on the basis of strong social ties. We therefore model informal investors as a type of entrepreneurial individual who brings tacit knowledge as well as finance to the new venture; they are not simply another class of financial intermediary. This leads us to emphasise the role of individual experience and knowledge as well as the accumulated entrepreneurial experience in the social environment of their peer groups.

### 2.2 Individual entrepreneurial experience

Prior studies from a variety of disciplines have examined the role of entrepreneurial experience in shaping new venture outcomes (e.g. Chandler, 1996; Davidsson & Honig, 2003; Estrin et al., 2016; Lazear, 2004; Qin et al., 2017). If early-stage informal investors are more like partners to the founders, even co-entrepreneurs, then, their individual attributes, especially their entrepreneurial experience, may influence their propensity to become engaged in the new venture. We posit that entrepreneurial experience will help informal investors to advise entrepreneurs and so improve the value of such investments to both parties.

Entrepreneurship is a unique type of economic activity that requires specific skills about how to organise ideas and capabilities in order to produce new products and services under uncertain conditions (Alvarez & Barney, 2007; Davidsson, 2016; Mickiewicz et al., 2017; Qin et al., 2019). Knowledge pertaining to the firm-founding process, especially tacit knowledge or know-how, is usually obtained from previous experience in similar activities (Estrin et al., 2016), and prior entrepreneurial experience can therefore make someone more skilled in assessing the quality of new venture ideas (Collewaert & Manigart, 2016). Individuals who already have firm-founding experience may therefore be better equipped with expertise needed by new ventures. The development of a new venture may also be influenced by investors' injections of relevant and valuable network capital (Tenca et al., 2018; Wetzel, 1983), which again accumulates with entrepreneurial experience. The literature has also shown that informal investors support entrepreneurs as mentors and often inject human and social capital (Mason, 2016; Tenca et al, 2018; Wetzel, 1983) including through the provision of strategic and operational expertise (Edelman et al., 2017). They can also be a source of soft skills and business judgement (Becker-Blease & Sohl, 2015), as well as helping entrepreneurs to develop their presentational skills (Clark, 2008). Prior entrepreneurship experience can therefore increase the value of informal investors' contribution to the new venture by increasing entrepreneurs' skills and by enhancing their confidence. This may be in part a direct learning effect; past experience can help to accumulate and integrate new knowledge, facilitating application to new situations (Weick, 1996). People

with prior entrepreneurship experience may also be more willing to invest in new ventures because of a stronger and more focused entrepreneurial mindset (McGrath & Macmillan, 2000), which then prompts them to assume the risks of investing in start-ups (Estrin et al., 2018; Tenca et al., 2018).

At the same time, social homophily theory predicts that ties are likely to be formed between parties with shared characteristics (Lazarsfeld & Merton, 1954; McPherson et al., 2001). Homophily effects have been examined in a variety of contexts, to explain both interpersonal and interorganizational relationships (Ahuja et al., 2009; Duncan et al., 1968; Fernandez & Sosa, 2005; Greenberg & Mollick, 2015, 2017; Hegde & Tumlinson, 2014; Kandel, 1966; Kleinbaum et al., 2013; Kossinets & Watts, 2009; Ibarra, 1992; Powell et al., 2005; Rosenkopf & Padula, 2008; Rubineau & Fernandez, 2013; Wimmer & Lewis, 2010; Zeng & Xie, 2008). It is known that entrepreneurs form a distinctive occupational category who share many common characteristics (Barringer et al., 2005; Davidsson & Honig, 2003; Lofstrom et al., 2014; Unger et al., 2011). Shared experience based on entrepreneurship can be contrasted with that based on more hierarchical work activities, as a distinctive foundation for social linkages based on occupation (McPherson et al., 2001). Individuals with past entrepreneurial experience may therefore be more willing to support those who are now engaged in similar entrepreneurial endeavours, appreciating and understanding the efforts of other entrepreneurs. While these arguments are familiar for entrepreneurs, they have been less commonly considered for informal investors, and they represent a building block for our subsequent theorising.

We therefore propose as a baseline the following hypothesis:

> **H1:** *Individuals with entrepreneurial experience have a higher propensity to act on a new venture idea as an informal investor.*

### 2.3 Entrepreneurship capital

It is a core insight of sociology that individual business actions are embedded in their social environment (Coleman, 1988; Granovetter, 1985). Previous research has stressed the relevance of social context for entrepreneurial activities (Bjørnskov & Foss, 2013; Davidsson, 2016; Foss et al., 2013; Kim et al., 2016; Qin, 2011; Qin et al., 2017; Sarasvathy & Venkataraman, 2011; Welter, 2011). Moreover, peer influence has been identified as a driving force of entrepreneurship (Lerner & Malmendier, 2013; Kacperczyk, 2013; Nanda & Sørensen, 2010; Qin & Estrin, 2015; Stuart & Ding, 2006; Tartari et al., 2014; Thornton, 1999). We extend these arguments to the situation of informal investors, proposing that the societal context, particularly activities undertaken by other individuals in peer groups (Becker-Blease & Sohl, 2007), is a key mechanism through which potential investable entrepreneurial ventures are identified and evaluated.

Being an early-stage informal investor in a new venture relies on the exploitation of informal networks (Mason & Harrison, 1997). Indeed, Maula et al., (2005, p. 463) emphasise the importance of 'knowing entrepreneurs personally' for being an informal investor, and such arguments generalise, because of low transactions and communications costs in a digital world, to broader social networks and peer groups (Goldfarb & Tucker, 2019; Sussan & Acs, 2017). Given the tacit character of the knowledge that is required, social ties are especially instrumental in facilitating the enactment of entrepreneurial ideas when they involve parties with entrepreneurship-specific knowledge. In particular, we argue that a higher density of existing entrepreneurship in a social group can lead to a better chance that the relevant ties will be formed. A peer environment with a larger number of existing entrepreneurs provides both role models and more networking opportunities for individuals to form those entrepreneurship-relevant ties that are critical for access to knowledge and for identifying and obtaining other resources including finance (Davidsson & Honig, 2003). This argument parallels Audretsch and Keilbach's (2004) idea that entrepreneurial activity will be more prevalent in social environments with entrepreneurial characteristics. We apply their label of *entrepreneurship capital*[3] to the network spillover effect and argue that, especially in a digitalised economy (Acs et al., 2021), a greater number of entrepreneurs in their peer group implies that potential early venture stage informal investors will be more likely to encounter investment opportunities and start-up projects from which to choose.

[3] This mechanism corresponds to the knowledge spillover theory of entrepreneurship (Acs et al., 2009), which argues that knowledge-intense environments enhance entrepreneurial opportunities (Audretsch & Keilbach, 2007).

A social environment with a larger number of existing entrepreneurs — with high levels of entrepreneurial capital — therefore provides more opportunities for networking (Hughes et al., 2007). These are critical for access to knowledge and for identifying and obtaining other resources, as well as to benefit from spillover effects whereby entrepreneurs learn from each other (Vismara, 2016),[4] generating more successful *matches* between business founders and early-stage informal investors. An entrepreneurship-rich milieu can also exert peer influence on the member of the society by increasing the visibility of successful ventures and by creating role models (Qin & Estrin, 2015). Past research on peer influence has suggested that peer influence can occur without direct interactions among group members in shaping individual's aspirations and behaviours (e.g. Dobrev, 2005; Qin & Estrin, 2015). Thus, peer groups should not be narrowly defined by direct interactions between group members but rather a group of people whom the focal individual may perceive as a reference group for their own choices. Higher entrepreneurship capital in one's broader peer group beyond direct contacts may shape individuals' aspirations towards entrepreneurial activities and promote a more positive social attitude among potential investors towards business creation activities, leading people with disposable financial resources to favour investments in entrepreneurial ventures against alternatives. Higher levels of entrepreneurship capital may also foster a culture with higher tolerance for risks and failure, promoting more of both new ventures and informal investments. Thus, we expect that these effects (reference, comparison and network-augmenting) effects will play a strong role within social peer groups:

**H2:** *The propensity for an individual to invest informally in a new venture in its early stage is positively influenced by the entrepreneurship capital in her/his broad peer group.*

[4] The positive environmental effects of entrepreneurship capital may to some extent be counterbalanced by the impact of more intense resource competition among entrepreneurs (Audretsch & Keilbach, 2004). However, a larger number of entrepreneurs also offers a larger pool of investment opportunities and a higher quality of start-up projects for investors, who may be in a position to pick up the most promising projects to support.

### 2.4 Cross-level effects: the interplay of individual experience and entrepreneurship capital

We next discuss the interplay of individual entrepreneurial experience and peer network entrepreneurial capital in influencing informal investment decisions. In addition to stimulating investment directly, peer effects may also compensate for the lack of individual entrepreneurship experience. Individuals who do not have such experience can still gain exposure to the issues involved in the new venture creation if there is a high level of entrepreneurship capital. One mechanism through which entrepreneurship capital facilitates informal investment is the dissemination of knowledge: acting as a conduit to promote the circulation and commercialisation of 'uncertain and asymmetric ideas' among community members (Audretsch & Keilbach, 2004, p. 422). Thus, peer groups rich in knowledge about, and experience with, entrepreneurial activities are particularly useful for those who are less experienced, because the value of the knowledge drawn from the environment is relatively greater for them. Operating in a dense environment in terms of entrepreneurial experience helps informal investors to offset any inexperience in entrepreneurship by allowing them to learn from veterans and to build business contacts to access information and investment opportunities. Thus, those who are more limited in their personal knowledge and contacts are likely to benefit relatively more from such peer group–based knowledge spillover effects. Also, mutual influence in peer groups supporting innovation is particularly important (McPherson et al., 2001) and that argument easily extends to entrepreneurship. Therefore, one might expect a compensation effect from entrepreneurship-rich peer contexts, whereby the positive effect of entrepreneurship capital will be more important for informal investors with less of their own entrepreneurial experience. Due to learning and knowledge spillover effects within peer groups, we expect that entrepreneurship capital will substitute for individual experience of early venture stage informal investors:

**H3:** *The effect of an individual's entrepreneurship experience on the propensity to invest in a new venture as an informal investor will be attenuated for individuals whose peer groups have stronger entrepreneurial capital.*

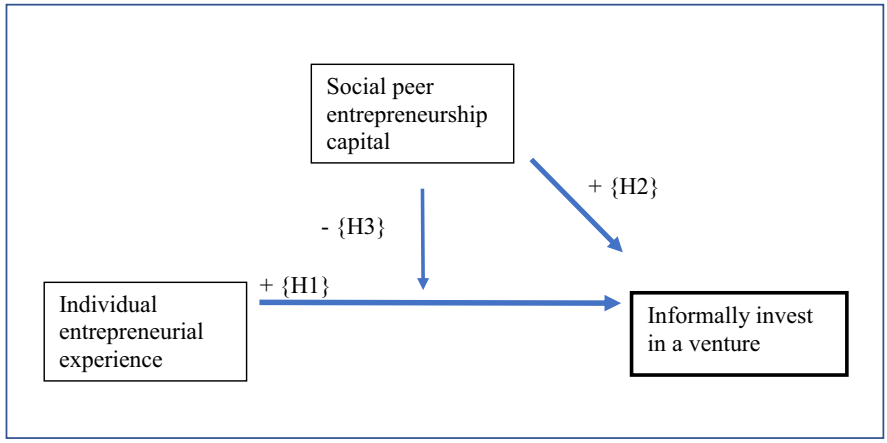


**Fig. 1** Hypotheses on individual, contextual and cross-level effects on entrepreneur and informal investor

Our conceptual framework is illustrated in Fig. 1.

## 3 Data and methods

### 3.1 Data and variables

To test our hypotheses, we use a large dataset constructed by combining information from the Global Entrepreneurship Monitor (GEM), containing 1,287,997 individuals across 92 countries and 14 years, with country-level data added from the World Bank and from the Polity project. The GEM project is seen as unique for entrepreneurship research in that it is multi-country, allowing for heterogeneity at the macro- and, as we now propose, meso-level, but also contains individual data, being based on representative population surveys across countries. It also uses validated measures of entrepreneurship (Davidsson, 2016).

In our analysis, we examine the effects of individual entrepreneurial experience and social peer influence on early stage informal investors. We follow Ding et al. (2015), and for our dependent variable, we use informal investment (*busang*) in the GEM dataset; it captures whether an individual has personally invested in other businesses in the past 3 years. Note that this notion of an early-stage informal investor as someone providing financial support is common across developed and developing economies contexts: the GEM operationalisation therefore overcomes context specificity. At the same time, our models are robust to the variation in the latter as we utilise wide cross-country heterogeneity.

To capture individual entrepreneurship experience, we use the indicator (dummy) variable concerning engagement in already established projects in which individuals are still involved as owner-managers (variable 16 in Table 1). As a related control, we also include the indicator variable capturing prior engagement in projects that have since been discontinued (variable 17 in Table 2). The latter captures a different form of experience effect, namely, learning from previous business failure.

Turning to the explanatory variables related to peer effects (H2 and H3), we operationalise entrepreneurship capital with meso-level indicators, specifically, the proportion of business owner-managers in each specified social peer group in each country. We follow McPherson et al. (2001) and identify the social peer groups in terms of the two primary sociodemographic characteristics that sort individuals into groups within which social networks are likely to form, namely, by ascribed characteristics (age and gender) and by acquired characteristics (education and income). Following this logic, we first calculate separate country-male and country-female, means for being an owner-manager of an established business, assigning it by gender declared by the respondent. Next, we calculate proxies for entrepreneurship capital for ten age categories for each country (at 5 years age intervals). For education, we use four groups: no secondary level educational attainment; some secondary; complete secondary; and tertiary, respectively. Finally, for household income, we use the available GEM classification distinguishing between low-, middle- and high-income groups, again calculating these means for each country and each peer

**Table 1** Description of variables and descriptive statistics

| Variable | Mean | Std.Dev | Min | Max |
|---|---|---|---|---|
| /1/ Involved in nascent start-up or owner-manager of business < 42 month old | 0.09 | 0.29 | 0.00 | 1.00 |
| /2/ Involved as early venture stage informal investor within last 2 years | 0.04 | 0.20 | 0.00 | 1.00 |
| /3/ Age 20–24 | 0.11 | 0.31 | 0.00 | 1.00 |
| /4/ Age 25–29 | 0.11 | 0.31 | 0.00 | 1.00 |
| /5/ Age 30–34 | 0.12 | 0.32 | 0.00 | 1.00 |
| /6/ Age 35–39 | 0.12 | 0.32 | 0.00 | 1.00 |
| /7/Age 40–44 | 0.12 | 0.33 | 0.00 | 1.00 |
| /8/ Age 45–49 | 0.11 | 0.31 | 0.00 | 1.00 |
| /9/ Age 50–54 | 0.11 | 0.31 | 0.00 | 1.00 |
| /10/ Age 55–59 | 0.09 | 0.28 | 0.00 | 1.00 |
| /11/ Age 60–64 | 0.09 | 0.28 | 0.00 | 1.00 |
| /12/ Female | 0.52 | 0.50 | 0.00 | 1.00 |
| /13/ Education: some secondary | 0.25 | 0.43 | 0.00 | 1.00 |
| /14/ Education: secondary | 0.33 | 0.47 | 0.00 | 1.00 |
| /15/ Education: tertiary | 0.36 | 0.48 | 0.00 | 1.00 |
| /16/ Manages and owns a business that is older than 42 months | 0.07 | 0.26 | 0.00 | 1.00 |
| /17/ In the past 12 months: sold, shut down, discontinued, or quit business | 0.04 | 0.19 | 0.00 | 1.00 |
| /18/ Medium income | 0.34 | 0.47 | 0.00 | 1.00 |
| /19/ High income | 0.33 | 0.47 | 0.00 | 1.00 |
| /20/ Share of established business owners (country-year) | 0.07 | 0.04 | 0.00 | 0.38 |
| /21/ Share of est. bus. owners (country-year-education) minus country-year share | 0.00 | 0.02 | −0.27 | 0.45 |
| /22/ Share of those who discontinued businesses (country-year) | 0.04 | 0.04 | 0.00 | 0.30 |
| /23/ Constrains on the executive branch of government (lagged) | 5.99 | 5.89 | 1.00 | 7.00 |
| /24/ Natural logarithm of population (lagged) | 17.14 | 1.49 | 11.54 | 21.03 |
| /25/ GDP per person employed (constant 2011 PPP $, lagged) | 63,923 | 29,755 | 1837 | 197,259 |
| /26/ Inflation, GDP deflator (annual %, lagged) | 4.08 | 5.54 | −27.63 | 56.50 |
| /27/ GDP growth (annual %, lagged) | 2.72 | 3.32 | −14.33 | 22.59 |

group separately and assigning those to the individual according to the group to which she/he belongs.

It is important to ensure that these meso-level peer effects are not confounded with country-level variation. Therefore, following the logic of multilevel modelling (e.g. Snijders & Bosker, 2012), in each case, we use two variables: (1) the difference between the peer group-level effect and the corresponding country-level business-owner-manager mean effect, alongside (2) the country-level business-owner-manager mean effect. This is a strong and demanding formulation that gives some confidence that we have isolated the pure (relative) group effect in which we are interested.

In our regressions, to address potential issues of omitted variable bias, we add the large number of explanatory variables at the individual and country levels used in previous studies of the determinants of entrepreneurial activity (e.g. Autio & Acs, 2010; Bowen & De Clercq, 2008; Estrin et al., 2013a). Thus, at the individual level, we control for age, gender, income and the educational attainment of the person, as well as whether they are a current owner-manager of an established firm and if they discontinued one in the last 12 months. At the country level, we control for a wide variety of institutional and economic characteristics (e.g. Estrin et al., 2013a), namely, the rule of law (effective constraints on the executive branch of the government, taken from Polity IV project, coordinated by the Centre for Systemic Peace, Vienna, VA), plus the level of development (GDP per capita), inflation (GDP deflator), and GDP growth, all from World Bank. Furthermore, because the social homophily literature emphasises potential

**Table 2** Results of logit regressions, model without interactions

| Variables | (1)<br>*Informal investor* |
|---|---|
| Age 20–24 | 1.168*** |
| | (0.034) |
| Age 25–29 | 1.349*** |
| | (0.040) |
| Age 30–34 | 1.322*** |
| | (0.040) |
| Age 35–39 | 1.306*** |
| | (0.041) |
| Age 40–44 | 1.199*** |
| | (0.039) |
| Age 45–49 | 1.198*** |
| | (0.040) |
| Age 50–54 | 1.171*** |
| | (0.040) |
| Age 55–59 | 1.211*** |
| | (0.042) |
| Age 60–64 | 1.243*** |
| | (0.042) |
| Female | 0.687*** |
| | (0.011) |
| Education: some secondary | 1.212*** |
| | (0.027) |
| Education: secondary | 1.449*** |
| | (0.033) |
| Education: tertiary | 1.846*** |
| | (0.041) |
| Manages and owns a business that is older than 42 months (**H1**) | **1.654*****<br>**(0.022)** |
| In the past 12 months, sold, shut down, discontinued, quit (**H1 alt**) | **3.271*****<br>**(0.045)** |
| Medium income | 1.246*** |
| | (0.018) |
| High income | 1.810*** |
| | (0.035) |
| Share of established business owners (country-year) | 2.428 + |
| | (1.183) |
| Share of est. bus. owners (country-year-age cohort) **(H2)** | **2.709*****<br>**(0.341)** |
| Share of est. bus. owners (country-year-income group) **(H2)** | **5.573*****<br>**(1.452)** |
| Share of est. bus. owners (country-year-education group) **(H2)** | **0.993**<br>**(0.181)** |
| Share of est. bus. owners (net country-year-gender) **(H2)** | **2.460****<br>**(0.762)** |
| Share of those who discontinued business (country-year) | 10,721.061*** |
| | (7,119.409) |
| Constrains on the executive branch of government (lag) | 0.981 |
| | (0.018) |
| Natural logarithm of population (lagged) | 0.938*** |
| | (0.015) |
| GDP per person employed (constant 2011 PPP $, lagged) | 1.000 |
| | (0.000) |
| Inflation, GDP deflator (annual %, lagged) | 0.994 |
| | (0.004) |
| GDP growth (annual %, lagged) | 1.022** |
| | (0.008) |
| Year = 2002 | 0.624*** |
| | (0.075) |
| Year = 2003 | 0.211* |
| | (0.129) |
| Year = 2004 | 1.158 |
| | (0.594) |
| Year = 2005 | 0.599*** |
| | (0.069) |
| Year = 2006 | 0.679*** |
| | (0.072) |
| Year = 2007 | 0.683*** |
| | (0.069) |
| Year = 2008 | 0.818* |
| | (0.082) |
| Year = 2009 | 0.573*** |
| | (0.055) |
| Year = 2010 | 1.032 |
| | (0.108) |
| Year = 2011 | 0.936 |
| | (0.113) |
| Year = 2012 | 0.940 |
| | (0.087) |
| Year = 2013 | 0.889 |
| | (0.099) |
| Year = 2014 | 1.002 |
| | (0.091) |
| Random intercept[country_year] | 2.718 |
| | (0.000) |
| Var(random intercept) | 1.267*** |
| | (0.021) |
| Covariance of random intercepts (with start-up equation) | 1.072*** |
| | (0.011) |

**Table 2** (continued)

| Variables | (1) *Informal investor* |
|---|---|
| Constant | 0.038*** |
| | (0.013) |
| Observations | 1,290,164 |

1,290,164 observations

Odd ratios reported instead of raw logit coefficients

*** p < 0.001, ** p < 0.01, * p < 0.05, + p < 0.10

network size as the main channel of peer effects (McPherson et al., 2001), we also control for the population size of each country. All these macro-control variables are lagged by 1 year to alleviate potential endogeneity.

We present the variable definitions in Table 1. A correlation table is also available on request. Collinearity was not found to be a serious problem, and in any case, it would be counterbalanced by the very large sample size that makes coefficients insensitive to specification; as argued by Goldberger (1991), collinearity becomes a serious problem only if combined with 'micronumerocity'.

### 3.2 Regression models

Our hypotheses are tested with models that estimate the likelihood that an individual is an early-stage new venture informal investor.[5] This leads us to apply bivariate logit models. These models include the above listed explanatory variables. We apply multilevel techniques, that is, the estimates are enhanced with country-year random effects to address potential problems of country- and time-specific heterogeneity (e.g. Hox et al., 2018; Snijders & Bosker, 2012). This design follows earlier GEM-based research (e.g. Autio & Acs, 2010; Estrin et al., 2013a; Estrin et al., 2013b, 2016; Stephan et al., 2015). Our hypothesis tests are based on the sign and significance of the relevant independent variable coefficients.

[5] We estimate it jointly with that of the likelihood of an individual being an entrepreneur to enhance the robustness of our results, because these two choices are highly interdependent (using gsem command in Stata). However, we only report results on informal investors, the concern of this paper; results on entrepreneurs are available on request.

## 4 Results

The results are presented in Tables 2, 3 and 4. To allow for the direct evaluation of the size of the estimated effects, we present odd ratios instead of raw logit coefficients. For hypotheses 1 and 2, we rely initially on model 1 (in Table 2), estimated using the full set of individual- and country-level variables but excluding any interactive effects. To facilitate the analysis, in Table 2, we highlighted the corresponding odds ratios in bold.

We use models 2, 3, 4 and 5 to test hypothesis 3 concerning the cross-level interaction effects between individual entrepreneurial experience and the entrepreneurial experience of the peer groups, again highlighting the odds ratios in bold.

Hypothesis 1 concerns the impact of business experience. The analysis yields strong support for this hypothesis: the coefficients on our indicator of business experience related to individuals who manage or own a business older than 42 months are all positive and highly significant (models 1, 2, 3, 4 and 5). The coefficient on our parallel indicator of experience (sold, shut down, discontinued or quit business in the past 12 months) is also statistically significant with the expected sign.

Hypothesis 2 concerns the impact of entrepreneurship capital on the propensity to be an early-stage informal investor. Significantly strong positive peer effects are observed in most of the socio-demographics groups that we test in our model, namely, peer groups based on age, gender and income. However, entrepreneurship capital effects are not observed in the peer groups based on education categories (Table 2, model 1); we return to this issue in the discussion.

Based on the odds ratios, we also find support for hypothesis 3 concerning the moderating effects of entrepreneurship capital on the relationship between entrepreneurship experience and the likelihood of being an early venture stage informal investor. Thus, the odds ratios of the interactive term between individual business experience and entrepreneurship capital are negative in models 2, 3, 4 and 5, and these effects are highly significant.

We note however the discussion on the validity of interactive effects in logit models as evaluated by odds ratios, initiated by Ai and Norton (2003). While there is a methodological tradition that supports

the odds ratio treatment of interactive effects (Buis, 2010), the recent conclusion is that the (multiplicative) effects based on odds ratios and the (additive) marginal effects should both be considered. These two are different ways to conceptualise the effects, and the problem is that they may or may not be consistent with each other for interactions, both in terms of significance and even of direction (Dow et al., 2019). Therefore, we utilise Ai and Norton's (2003) computational method for marginal effects, implemented with appropriate handling of *Margins* command in Stata (Karaca-Mandic et al., 2012). When our interactive effects are evaluated as marginal effects, the results are insignificant. Thus, hypothesis 3 is only partly supported.

Our analysis yields other interesting findings. We further unpack the effects of previous entrepreneurial experience by having a second variable that can be considered a proxy for experience; that is, in addition to continued business ownership, in all our models, we also include a dummy variable corresponding to prior involvement in discontinued or sold businesses. The latter effect is always positive and highly significant on the likelihood of getting involved as an informal investor.

Another important element of human capital, of a more general nature, is proxied by education (Estrin et al., 2016). Here, we find a clear pattern. When one moves higher up the educational ladder, the effect on the likelihood of being engaged in informal investment becomes larger.

Finally, we get some interesting results on macroeconomic variables that deserve further exploration. Not surprisingly, we found lagged economic growth to be associated positively with the likelihood of informal investment. More worthy of note, the finding from previous research that higher level of development is associated with lower entrepreneurial propensity (Estrin et al., 2019) does not seem to apply to informal investment activities; the likelihood of being an investor is actually stronger in developed economies.

## 5 Discussion

Informal investors should not be seen narrowly just as providers of early-stage entrepreneurial finance. Rather, we argue that informal investors are socially embedded individuals who make the decision to invest their own money in new ventures, influenced by both their individual attributes and their social context. Based on this insight, we develop a multilevel theoretical framework on the factors influencing informal investment and test hypotheses concerning individual, peer and cross-level effects. We find that individual entrepreneurship experience and environmentally embedded entrepreneurial capital both positively affect informal investment.

At the individual level, whether individuals act as informal investors is influenced by their prior entrepreneurship experience. Drawing from social homophily theories, we argue that past individual entrepreneurial experience is conducive to enhancing linkages and participation in the social networks of entrepreneurs that are particularly critical to the likelihood of being an informal investor. Thus, social homophily effects can result in the formation of ties between informal investors who are former entrepreneurs and business founders seeking investment.

However, it could also be that the role of experience is especially important for informal investors because of a possible selection effect. Informal investors need financial resources to engage in current entrepreneurial ventures, which imply that their previous entrepreneurial experience has probably been successful. Indeed, the evidence suggests that informal investors have significant financial muscle, which largely derives from previous entrepreneurial engagement (OECD, 2011). We also control for household income in our estimating equations. Therefore, the finding of a strong positive effect of experience on informal investors suggests that there may be a possible selection effect via the accumulation of wealth. To shed more light on this issue, we compare our results on experience through established business ownership and management with experience accrued through past engagement in business that was discontinued. The effects of both variables on informal investor engagement are positive. However, the odds ratios related to discontinued businesses are much larger, in all models at least twice as large. This finding implies that it is the experience rather than the (accumulated wealth based) selection effect that is more important in explaining informal investment engagement. This is in line with research that calls for the examination of the role of failure in the

entrepreneurial process (Levie et al., 2011), and more research is needed here.

Turning to the contextual effects, we hypothesise positive social peer effects on informal investment; individuals embedded in social groups with a higher density of business owners are more likely to be informal investors. This idea is supported by the data. We find that peer effects — which we term entrepreneurial capital — influence the likelihood that an individual chooses to be an investor consistently, in a variety of peer groups exhibiting entrepreneurial traits, where these groups are based on the characteristics of age, gender, income, yet less so of education (though note the interactive effects). Furthermore, we find some evidence that social influence compensates for an individual's lack of experience, but here, the evidence is weaker; it crucially depends on how we evaluate interactive effects (additively versus multiplicatively).

## 6 Robustness test based on regional data

The models we discussed so far included peer effects based on country-level averages for particular reference groups. Here, we also verify if and how the homophily effects we postulated change when we disaggregate from the national to the regional level. For this purpose, we utilise the UK GEM data with location identifiers for 2002–2019, which we merged with the Office for National Statistics data for regional level controls. The UK is one of the very few national GEM teams that collects large annual samples (typically around 10,000 respondents), which enables meaningful regional comparisons (Hart et al., 2020). The results are presented in the Appendix (Table 5). They are based on single multilevel logit equations. The specifications follow closely those reported above in Table 2, except for some minor differences in groupings of age, income and education variables, where more detailed categories were available compared to the worldwide sample. The random effects are now based on NUTS2 UK region — year combinations, as are the peer effects, and the four macro-level controls which correspond to what we applied at country level. Thus, apart for more detailed (regional rather than national) groupings for some variables, the description of variables remains the same as in Table 1.

Interestingly, the share of established business owners calculated at NUTS2 UK level gains in significance compared with the country-level effects we reported in Table 2. Across the five models we report in Table 5, for four models, the variable is significant at 0.01 level, and for one model, it is significant at 0.05 probability level. In contrast, in the previous country-level models reported in Tables 2 and 3, these effects were significant either at the 0.05 or borderline significant at the 0.10 threshold. We could interpret these effects as a fifth type of peer group effect: a regional one based on neighbourhood.

Hence, neighbourhood (region-based) effects are now more significant compared to country level, and those based on age and income (in models 2 to 5 of Table 5) (corresponding to those we estimated in models reported in Table 2) are still significant though a bit weaker. However, some other peer group effects, those based on education and gender, become insignificant at the less aggregated level.

We think we understand why these effects may be relatively weaker for the UK. This is because when considering social effects, we need to take into account the context of informal institutions. In particular, we would expect more rigid social cleavages based on education, income, gender and possibly age in countries which are characterised by cultural values of high-power distance. The latter corresponds to the social acceptance of the unequal distribution of power (Hofstede et al., 2010). In that case, social status gains in importance, and it is based on income, education, and gender as related to traditional notions of patriarchy and possibly age. This implies that social barriers along these dimensions become stronger, and, as the social groups are more clearly separated, the homophily effects within each group are stronger. Yet, the UK is characterised by low power distance cultural values (Taras et al., 2012); therefore, the homophily effects may be weaker.

The UK is also characterised by high degree of individualism (Taras et al., 2012), a cultural value dimension that is closely correlated with low power distance (Beugelsdijk & Welzel, 2018; Minkov et al., 2017). Individualism corresponds to the situation where ties between people are loose and social groups

**Table 3** Results of logit regressions, models with interactions

| Variables | (2)<br>Informal investor | (3)<br>Informal investor |
|---|---|---|
| Age 20–24 | 1.154*** | 1.186*** |
| | (0.034) | (0.035) |
| Age 25–29 | 1.315*** | 1.407*** |
| | (0.039) | (0.041) |
| Age 30–34 | 1.272*** | 1.429*** |
| | (0.039) | (0.041) |
| Age 35–39 | 1.250*** | 1.444*** |
| | (0.040) | (0.042) |
| Age 40–44 | 1.145*** | 1.350*** |
| | (0.038) | (0.039) |
| Age 45–49 | 1.143*** | 1.364*** |
| | (0.039) | (0.040) |
| Age 50–54 | 1.117** | 1.337*** |
| | (0.039) | (0.040) |
| Age 55–59 | 1.156*** | 1.373*** |
| | (0.040) | (0.042) |
| Age 60–64 | 1.190*** | 1.386*** |
| | (0.041) | (0.043) |
| Female | 0.660*** | 0.659*** |
| | (0.006) | (0.006) |
| Education: some secondary | 1.208*** | 1.202*** |
| | (0.026) | (0.027) |
| Education: secondary | 1.443*** | 1.443*** |
| | (0.030) | (0.033) |
| Education: tertiary | 1.840*** | 1.832*** |
| | (0.039) | (0.041) |
| Manages and owns a business that is older than 42 months **(H1)** | **1.733*** ** | **1.690*** ** |
| | **(0.024)** | **(0.022)** |
| In the past 12 months, sold, shut down, discontinued, quit (**H1 alt**) | **3.264*** ** | **3.270*** ** |
| | **(0.045)** | **(0.045)** |
| Medium income | 1.296*** | 1.296*** |
| | (0.017) | (0.017) |
| High income | 1.996*** | 1.996*** |
| | (0.025) | (0.025) |
| Share of establ. business owners (country-year) | 2.700* | 2.543+ |
| | (1.319) | (1.243) |
| Share of est. bus. owners (country-year-age group) | 4.593*** | |
| | (0.648) | |
| Manages/own est. bus. X Share of estab bus (c-y-age) **(H3)** | **0.186*** ** | |
| | **(0.039)** | |
| Share of est. bus. owners (country-year-education category) | | **1.645*** |
| | | **(0.332)** |
| Manages/own est. bus. X Share of estab bus (c-y-ed) **(H3)** | | **0.298** ** |
| | | (0.117) |

**Table 3** (continued)

| Variables | (2)<br>Informal investor | (3)<br>Informal investor |
|---|---|---|
| Share of those who discontinued bus. (country-year) | 12,532*** | 13,581*** |
| | (8,341.688) | (9,040.945) |
| Constrains on the executive branch of government (lagged) | 0.985 | 0.982 |
| | (0.018) | (0.018) |
| Natural logarithm of population (lagged) | 0.940*** | 0.939*** |
| | (0.015) | (0.015) |
| GDP per person employed (const 2011 PPP $, lagged) | 1.000 | 1.000 |
| | (0.000) | (0.000) |
| Inflation, GDP deflator (annual %, lagged) | 0.994 | 0.995 |
| | (0.004) | (0.004) |
| GDP growth (annual %, lagged) | 1.021* | 1.021* |
| | (0.008) | (0.008) |
| Year = 2002 | 0.625*** | 0.627*** |
| | (0.075) | (0.076) |
| Year = 2003 | 0.213* | 0.214* |
| | (0.130) | (0.131) |
| Year = 2004 | 1.148 | 1.151 |
| | (0.590) | (0.593) |
| Year = 2005 | 0.603*** | 0.603*** |
| | (0.070) | (0.070) |
| Year = 2006 | 0.683*** | 0.685*** |
| | (0.073) | (0.073) |
| Year = 2007 | 0.687*** | 0.686*** |
| | (0.070) | (0.070) |
| Year = 2008 | 0.814* | 0.814* |
| | (0.082) | (0.082) |
| Year = 2009 | 0.571*** | 0.572*** |
| | (0.055) | (0.055) |
| Year = 2010 | 1.011 | 1.014 |
| | (0.106) | (0.106) |
| Year = 2011 | 0.919 | 0.922 |
| | (0.111) | (0.112) |
| Year = 2012 | 0.928 | 0.930 |
| | (0.086) | (0.087) |
| Year = 2013 | 0.885 | 0.887 |
| | (0.099) | (0.099) |
| Year = 2014 | 0.997 | 0.999 |
| | (0.091) | (0.091) |
| Random intercept[country_year] | 2.718 | 2.718 |
| | (0.000) | (0.000) |
| Var(random intercept) | 1.269*** | 1.269*** |
| | (0.021) | (0.021) |
| Covariance of random intercepts | 1.074*** | 1.074*** |
| | (0.011) | (0.011) |

**Table 3** (continued)

| Variables | (2) Informal investor | (3) Informal investor |
|---|---|---|
| Constant | 0.036*** | 0.033*** |
| | (0.012) | (0.011) |
| *Observations* | *1,290,164* | *1,290,164* |

1,290,164 observations

Odd ratios reported instead of raw logit coefficients

*** $p<0.001$, ** $p<0.01$, * $p<0.05$, + $p<0.10$

are less cohesive (Hofstede et al., 2010). Social contacts are characterised by more diverse patterns of interaction (Bennett & Nikolaev, 2020; Heine, 2020). This is why within-group relations that underlie homophily effects may be weaker in individualist societies.

Finally, the UK is a developed country, and that may also come with lower social differences. The gap between poor and good education may be relatively narrower. Likewise, income inequalities may translate into less radical differences than in poor countries. Again, this would suggest that the with-social group relations are more likely to be accompanied by multiple out-group relations, making our effects weaker. This conclusion may generalise to wider differences between developed and developing countries, but we have no comparative regional data to test it further.

## 7 Conclusions

Informal investors provide entrepreneurs with both finance and know-how. This observation led us to provide an analysis of the factors explaining an individual's propensity to engage in informal investment based on individuals' entrepreneurial experience and contextual peer group effects. Our work can be contrasted with the more traditional framing, where the distinction between early-stage informal investors, business angels investing during the scaling up phase, and venture capitalists remains blurred.

In the past, it has proved difficult to test cross-level effects, concerning both individual and peer groups, in a single study, due to data constraints. It has been hard to identify good-sized datasets with well operationalised variables at an individual- and meso-level. However, by adopting the lens of peer groups, we have been able to construct meso-level peer influence variables and test them in junction with individual-level and country-level effects in the largest existing entrepreneurship dataset. The huge cross-time and cross-country, individual GEM dataset has not previously been used to study peer social effects; to our best knowledge, we are the first to do so. Our approach opens new avenues for future efforts in cross-level studies. Of course, we do not propose that an individual has a realistic chance to form networks across his/her peer group country-wide, especially in large countries, though the effects of location will be to some extent mitigated by digitalisation leading to wider social networks. Nevertheless, if entrepreneurial capital is higher in his/her peer group, the likelihood that such local networks will be formed will also be higher, and this is our interpretation of the effects that we have found.

Our additional analysis of the UK data implies that culture may further influence the effect we observe here. Future studies can delve deeper into the complexity that arises from the interplay between meso-societal context and higher-level cultural context in affecting informal investment. This will require data with sufficiently large number of observations in both cross-country and within-country samples.

Related to that, the research presented here has some limitations. Perhaps most significantly, while the GEM database is a rich source of individual data about the decision to engage as an entrepreneur or an informal investor, our research is limited by the fact that it represents a series of cross-section time-series snapshots across countries, rather than a panel. As Hellmann and Thiele (2019) have highlighted, there is a dynamic element to the relationship between entrepreneurs and investors, which we have only been

**Table 4** Results of logit regressions, models with interactions

| Variables | (4) Informal investor | (5) Informal investor |
|---|---|---|
| Age 20–24 | 1.187*** | 1.187*** |
| | (0.035) | (0.035) |
| Age 25–29 | 1.410*** | 1.411*** |
| | (0.041) | (0.041) |
| Age 30–34 | 1.432*** | 1.433*** |
| | (0.041) | (0.041) |
| Age 35–39 | 1.447*** | 1.449*** |
| | (0.042) | (0.042) |
| Age 40–44 | 1.353*** | 1.354*** |
| | (0.039) | (0.039) |
| Age 45–49 | 1.367*** | 1.368*** |
| | (0.040) | (0.040) |
| Age 50–54 | 1.339*** | 1.341*** |
| | (0.040) | (0.040) |
| Age 55–59 | 1.376*** | 1.378*** |
| | (0.042) | (0.042) |
| Age 60–64 | 1.389*** | 1.390*** |
| | (0.043) | (0.043) |
| Female | 0.660*** | 0.691*** |
| | (0.006) | (0.011) |
| Education: some secondary | 1.203*** | 1.198*** |
| | (0.026) | (0.026) |
| Education: secondary | 1.441*** | 1.434*** |
| | (0.030) | (0.030) |
| Education: tertiary | 1.832*** | 1.826*** |
| | (0.038) | (0.038) |
| Manages and owns a business that is older than 42 m. **(H2)** | **1.698*** ** | **1.723*** ** |
| | **(0.024)** | **(0.024)** |
| In the past 12 m, sold, shut down, discontinued, quit (**H2 alt**) | **3.272*** ** | **3.268*** ** |
| | **(0.045)** | **(0.045)** |
| Medium income | 1.243*** | 1.295*** |
| | (0.018) | (0.017) |
| High income | 1.800*** | 1.996*** |
| | (0.035) | (0.025) |
| Share of establ. business owners (country-year) | 2.440 + | 2.400 + |
| | (1.187) | (1.172) |
| Share of est. bus. owners (country-year-income group) | 6.958*** | |
| | (1.908) | |
| Manages/own est. bus. X Share of estab bus (c-y-inc) **(H3)** | **0.429*** | |
| | **(0.171)** | |
| Share of est. bus. owners (country-year-gender) | | 3.988*** |
| | | (1.284) |
| Manages/own est. bus. X Share of estab bus (c-y-gen) **(H3)** | | **0.105*** ** |
| | | **(0.047)** |
| Share of those who discontinued bus. (country-year) | 11,444*** | 13,785*** |
| | (7,592.493) | (9,176.280) |
| Constrains on the executive branch of gov. (lagged) | 0.980 | 0.983 |
| | (0.018) | (0.018) |
| Natural logarithm of population (lagged) | 0.937*** | 0.939*** |
| | (0.015) | (0.015) |

**Table 4** (continued)

| Variables | (4) Informal investor | (5) Informal investor |
|---|---|---|
| GDP per person employed (const 2011 PPP $, lagged) | 1.000 | 1.000 |
| | (0.000) | (0.000) |
| Inflation, GDP deflator (annual %, lagged) | 0.995 | 0.995 |
| | (0.004) | (0.004) |
| GDP growth (annual %, lagged) | 1.022** | 1.021* |
| | (0.008) | (0.008) |
| Year = 2002 | 0.627*** | 0.627*** |
| | (0.075) | (0.076) |
| Year = 2003 | 0.213* | 0.214* |
| | (0.130) | (0.131) |
| Year = 2004 | 1.162 | 1.150 |
| | (0.596) | (0.592) |
| Year = 2005 | 0.600*** | 0.603*** |
| | (0.069) | (0.070) |
| Year = 2006 | 0.681*** | 0.684*** |
| | (0.072) | (0.073) |
| Year = 2007 | 0.682*** | 0.685*** |
| | (0.069) | (0.070) |
| Year = 2008 | 0.821* | 0.813* |
| | (0.082) | (0.082) |
| Year = 2009 | 0.576*** | 0.571*** |
| | (0.055) | (0.055) |
| Year = 2010 | 1.038 | 1.013 |
| | (0.108) | (0.106) |
| Year = 2011 | 0.939 | 0.922 |
| | (0.113) | (0.112) |
| Year = 2012 | 0.942 | 0.929 |
| | (0.087) | (0.086) |
| Year = 2013 | 0.891 | 0.886 |
| | (0.099) | (0.099) |
| Year = 2014 | 1.003 | 0.999 |
| | (0.092) | (0.091) |
| Random intercept [country_year] | 2.718 | 2.718 |
| | (0.000) | (0.000) |
| Var(random intercept) | 1.267*** | 1.269*** |
| | (0.021) | (0.021) |
| Covariance of random intercepts | 1.073*** | 1.075*** |
| | (0.011) | (0.011) |
| Constant | 0.037*** | 0.032*** |
| | (0.013) | (0.011) |

1,290,164 observations

Odd ratios reported instead of raw logit coefficients

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, + $p < 0.10$

able to infer indirectly in our analysis. Furthermore, given that the institutions are likely to change only slowly (Williamson, 2000), the length of the time series available within GEM makes it difficult to identify institutional effects in a convincing manner. This may help to explain the absence of any significant

relationship between institutional quality (rule of law) and the likelihood of informal investors' engagement. To some extent, these limitations will be addressed by the passing of time, as additional years become available for analysis. However, the key limitation, the absence of panel data, can only be addressed by a sustained data gathering exercise.

Our work has significant implications for policymakers. As we have noted, the literature focuses on the role of business angels, who are often seen as informal venture capitalists. We instead focus on the early-stage informal investors and conceptualise them as individuals who choose to use their experience and tacit knowledge, as well as their financial resources, to support entrepreneurs. Thus, from the policy perspective, the role of informal investors is central to the establishment of effective entrepreneurial ecosystems (Elert et al., 2019). Our results suggest that their engagement is sensitive not only to financial and tax incentives, upon which policy is now concentrated, but also to the entrepreneurial social environment and to peer group influences. Indeed, peer group effects substitute for direct entrepreneurial experience in the likelihood of informal investment. Thus, polices towards the formation of healthy entrepreneurial ecosystems should build more closely on networks of former entrepreneurs and people of similar peer group characteristics. Future research could also usefully explore in more depth what these characteristics might be. An additional line of inquiry could also explore cultural influences that either facilitate or inhibit use of some specific peer-based networks in societies, conditional on how much these cultures stress ingroups versus outgroups or strong versus weak ties, following the Granevotter's (1973) terminology.

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## Appendix

**Table 5** Results of logit regressions, UK sample, 2002–2019. Dependent variable: informal investor

| Variables | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Age = 25–34 years | −0.091 | −0.121 | −0.091 | −0.091 | −0.090 |
| | (0.083) | (0.084) | (0.083) | (0.083) | (0.083) |
| Age = 35–44 years | −0.033 | −0.116 | −0.032 | −0.033 | −0.032 |
| | (0.079) | (0.088) | (0.079) | (0.079) | (0.079) |
| Age = 45–54 years | 0.023 | −0.084 | 0.024 | 0.023 | 0.024 |
| | (0.079) | (0.093) | (0.079) | (0.079) | (0.079) |
| Age = 55–64 years | 0.247** | 0.144 | 0.247** | 0.247** | 0.247** |
| | (0.080) | (0.093) | (0.080) | (0.080) | (0.080) |
| Age = 65 years and more | 0.466*** | 0.429*** | 0.465*** | 0.466*** | 0.466*** |
| | (0.087) | (0.089) | (0.087) | (0.087) | (0.087) |
| Female | −0.469*** | −0.469*** | −0.469*** | −0.469*** | −0.390*** |
| | (0.037) | (0.037) | (0.037) | (0.037) | (0.077) |
| Education status = doctorate | 0.818*** | 0.816*** | 0.817*** | 0.840*** | 0.818*** |
| | (0.127) | (0.127) | (0.127) | (0.128) | (0.127) |
| Education status = master's degree | 1.017*** | 1.016*** | 1.017*** | 1.032*** | 1.017*** |
| | (0.091) | (0.091) | (0.091) | (0.092) | (0.091) |
| Education status = bachelor's degree | 0.752*** | 0.751*** | 0.751*** | 0.761*** | 0.752*** |
| | (0.085) | (0.085) | (0.085) | (0.085) | (0.085) |

**Table 5** (continued)

| Variables | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Education status = a levels or equivalent | 0.614*** | 0.613*** | 0.612*** | 0.617*** | 0.614*** |
| | (0.087) | (0.087) | (0.087) | (0.087) | (0.087) |
| Education status = gcse or equivalent | 0.316*** | 0.314*** | 0.315*** | 0.320*** | 0.316*** |
| | (0.088) | (0.088) | (0.088) | (0.088) | (0.088) |
| Education status = vocational qualification | 0.411*** | 0.410*** | 0.411*** | 0.421*** | 0.411*** |
| | (0.096) | (0.096) | (0.096) | (0.096) | (0.096) |
| Education status = other qualification | 0.201 | 0.197 | 0.197 | 0.207 | 0.200 |
| | (0.160) | (0.160) | (0.160) | (0.160) | (0.160) |
| Manages & owns a business that is older than 42 m | 0.711*** | 0.694*** | 0.693*** | 0.721*** | 0.706*** |
| | (0.053) | (0.054) | (0.054) | (0.054) | (0.053) |
| In the past 12 m, sold, shut down, discontinued | 1.717*** | 1.717*** | 1.716*** | 1.716*** | 1.717*** |
| | (0.060) | (0.060) | (0.060) | (0.060) | (0.060) |
| Head of household income = £11,500 to £17,499 | 0.296*** | 0.295*** | 0.296*** | 0.296*** | 0.296*** |
| | (0.089) | (0.089) | (0.089) | (0.089) | (0.089) |
| Head of household income = £17,500 to £29,999 | 0.598*** | 0.597*** | 0.546*** | 0.598*** | 0.598*** |
| | (0.078) | (0.078) | (0.081) | (0.078) | (0.078) |
| Head of household income = £30,000 to £49,999 | 0.753*** | 0.752*** | 0.701*** | 0.753*** | 0.752*** |
| | (0.079) | (0.079) | (0.081) | (0.079) | (0.079) |
| Head of household income = £50,000 to £99,999 | 1.058*** | 1.058*** | 0.917*** | 1.057*** | 1.057*** |
| | (0.081) | (0.081) | (0.096) | (0.081) | (0.081) |
| Head of household income = £100,000 or more | 1.778*** | 1.778*** | 1.640*** | 1.778*** | 1.778*** |
| | (0.090) | (0.090) | (0.103) | (0.090) | (0.090) |
| Share of established bus owners (NUTS2-yr) | 3.217** | 3.078** | 2.989* | 3.240** | 3.026* |
| | (1.181) | (1.183) | (1.185) | (1.181) | (1.195) |
| Share of establ. bus. owners (age 6 cat, NUTS2-yr) | | 1.476* | | | |
| | | (0.666) | | | |
| Share of establ. bus. owners (income, NUTS2-yr) | | | 1.982** | | |
| | | | (0.728) | | |
| Share of establ. bus. owners (education, NUTS2-yr) | | | | −0.607 | |
| | | | | (0.537) | |
| Share of establ. bus. owners (gender, NUTS2-yr) | | | | | 1.600 |
| | | | | | (1.358) |
| GDP growth (annual %, lagged, NUTS2) | −0.309 | −0.351 | −0.285 | −0.302 | −0.282 |
| | (1.185) | (1.185) | (1.184) | (1.186) | (1.186) |
| Inflation, GDP deflator (annual %, lagged, NUTS2) | 0.011 | 0.011 | 0.014 | 0.011 | 0.012 |
| | (0.014) | (0.014) | (0.014) | (0.014) | (0.014) |
| GDP p.c. (constant prices, lagged, NUTS2) | 4.799* | 4.618* | 4.990* | 4.822* | 4.817* |
| | (2.312) | (2.314) | (2.305) | (2.313) | (2.314) |
| Natural logarithm of population (lagged, NUTS2) | 0.072 | 0.070 | 0.076+ | 0.072 | 0.072 |
| | (0.046) | (0.046) | (0.046) | (0.046) | (0.046) |
| year of survey = 2003 | −0.192+ | −0.182 | −0.179 | −0.194+ | −0.195+ |
| | (0.115) | (0.115) | (0.115) | (0.115) | (0.115) |
| year of survey = 2004 | −0.311* | −0.307* | −0.300* | −0.313* | −0.313* |
| | (0.123) | (0.123) | (0.123) | (0.123) | (0.123) |

**Table 5** (continued)

| Variables | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| year of survey = 2005 | −0.210+ | −0.202 | −0.205 | −0.212+ | −0.215+ |
| | (0.126) | (0.126) | (0.126) | (0.126) | (0.126) |
| year of survey = 2006 | −0.335* | −0.325* | −0.329* | −0.336* | −0.339* |
| | (0.135) | (0.135) | (0.134) | (0.135) | (0.135) |
| year of survey = 2007 | −0.366* | −0.347* | −0.349* | −0.368* | −0.371* |
| | (0.158) | (0.158) | (0.157) | (0.158) | (0.158) |
| year of survey = 2008 | −0.650*** | −0.640** | −0.653*** | −0.649*** | −0.655*** |
| | (0.195) | (0.195) | (0.194) | (0.195) | (0.195) |
| year of survey = 2009 | −0.832*** | −0.824*** | −0.835*** | −0.831*** | −0.837*** |
| | (0.242) | (0.242) | (0.241) | (0.242) | (0.242) |
| year of survey = 2010 | 0.087 | 0.092 | 0.081 | 0.087 | 0.087 |
| | (0.250) | (0.249) | (0.249) | (0.250) | (0.250) |
| year of survey = 2011 | −0.095 | −0.085 | −0.101 | −0.096 | −0.101 |
| | (0.246) | (0.246) | (0.245) | (0.246) | (0.246) |
| year of survey = 2012 | −0.042 | −0.039 | −0.045 | −0.041 | −0.043 |
| | (0.256) | (0.255) | (0.255) | (0.256) | (0.256) |
| year of survey = 2013 | −0.268 | −0.268 | −0.279 | −0.267 | −0.269 |
| | (0.281) | (0.281) | (0.281) | (0.282) | (0.282) |
| year of survey = 2014 | −0.171 | −0.170 | −0.177 | −0.169 | −0.169 |
| | (0.299) | (0.299) | (0.298) | (0.299) | (0.300) |
| year of survey = 2015 | −0.177 | −0.178 | −0.196 | −0.176 | −0.176 |
| | (0.323) | (0.323) | (0.322) | (0.323) | (0.323) |
| year of survey = 2016 | −0.021 | −0.015 | −0.042 | −0.021 | −0.020 |
| | (0.384) | (0.384) | (0.383) | (0.384) | (0.384) |
| year of survey = 2017 | −0.101 | −0.102 | −0.110 | −0.101 | −0.099 |
| | (0.364) | (0.363) | (0.363) | (0.364) | (0.364) |
| Constant | −7.502*** | −7.404*** | −7.708*** | −7.501*** | −7.564*** |
| | (1.375) | (1.375) | (1.374) | (1.375) | (1.377) |
| Natural logarithm of random intercept variance | −5.048*** | −5.053*** | −5.118*** | −5.041*** | −5.022*** |
| | (1.273) | (1.271) | (1.340) | (1.264) | (1.245) |
| Observations | 237,135 | 237,135 | 237,135 | 237,135 | 237,135 |
| Number of NUTS2-years groups | 555 | 555 | 555 | 555 | 555 |

Standard errors in parentheses

Odd ratios reported instead of raw logit coefficients

*** $p<0.001$, ** $p<0.01$, * $p<0.05$, + $p<0.10$

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